

# EUROPEAN PATENT OFFICE

## Patent Abstracts of Japan

PUBLICATION NUMBER : 08176947  
PUBLICATION DATE : 09-07-96

APPLICATION DATE : 20-12-94  
APPLICATION NUMBER : 06316944

APPLICANT : NEW OJI PAPER CO LTD;

INVENTOR : KIN KASUMI;

INT.CL. : D04H 3/16 A61F 13/54 A61F 13/15 D04H 3/00

TITLE : SPUNBONDED NONWOVEN FABRIC

ABSTRACT : PURPOSE: To produce a nonwoven fabric excellent in strength, opening property and weave and suitable as a surface material of bulky and soft hygienic material.

CONSTITUTION: This spunbonded nonwoven fabric composed of a three layer structure is obtained by laminating a polyolefin-based continuous filament B having small heat shrinkage factor to both faces of a web comprising a polyolefin-based or a polyester-based continuous filament having large heat shrinkage factor and integrating the laminate through fusing area produced by thermal pressing, and has 10-50% difference of thermal shrinkage factor between the continuous filament A and the continuous filament B constituting the web and (35:65) to (65:35) absolute dry weight ratio of A:B, and in the nonwoven fabric, the web comprising the polyolefin-based continuous filament B having small heat shrinkage factor forms crepe by heat treatment of the nonwoven fabric.

COPYRIGHT: (C)1996,JPO

\* NOTICES \*

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

DETAILED DESCRIPTION

---

[Detailed Description of the Invention]

[0001]

[Industrial Application] this invention carries out the laminating unification of the web which consists of two sorts of continuation continuous glass fibers with which the rates of a thermal contraction differ, and relates to the span bond nonwoven fabric which has the heat-treated crepe. Furthermore, if it states in detail, this invention is a span bond nonwoven fabric which forms the crepe, is excellent in intensity, opening nature, and formation, and relates to the flexible nonwoven fabric which can be especially used suitably as facing of the hygienic goods of a disposable diaper or a sanitary napkin with bulky.

[0002]

[Description of the Prior Art] Compared with the staple-fiber nonwoven fabric which makes a staple fiber composition fiber, with high intensity, since it is comparatively cheap, the span bond nonwoven fabric which makes a continuation continuous-glass-fiber filament composition fiber is used for various uses. However, the span bond nonwoven fabric which generally consists of a continuation continuous glass fiber is inferior by bulky and flexibility compared with the staple-fiber nonwoven fabric which has a crimp. For this reason, it is at the span bond nonwoven fabric which consists of a continuation continuous glass fiber. a macromolecule polymer -- variant spinning -- in case melt spinning is carried out from a spinneret with a hole and extension solidification is subsequently carried out by the high-speed flow, after making a continuous-glass-fiber group discover a crimp by cooling only one side of this continuous-glass-fiber group, the manufacture method of a laminating and the span bond nonwoven fabric of making it unify is proposed in this continuous-glass-fiber group (JP,1-148862,A)

[0003] Although the span bond nonwoven fabric obtained by this method is flexible bulky, the crimp nature continuous glass fibers which adjoin at the time of opening become entangled, and there is a fault that formation becomes heterogeneous by poor opening, especially this inclination becomes remarkable by the small split of eyes. moreover, since it is not avoided, that a certain amount of crimp carries out actual [ of the latency crimp nature continuous glass fiber ] has the fault of poor opening which a crimp nature continuous glass fiber has In order to compensate this fault, the method of interweaving the non-compound-die continuous glass fiber which consists of a compound-die continuous glass fiber which is compounded with a parallel connected type or an eccentric sheath-core type, and has a crimp, and a single component is proposed (JP,5-195406,A). By this method, the opening nature of a compound-die continuous glass fiber which has a crimp becomes good, and a nonwoven fabric with homogeneous formation is obtained. However, if the ratio of the crimp nature continuous glass fiber actualized also in this method is enlarged, formation will get worse, and if it is made small, although formation becomes good, it has the fault that it is inferior in a loft. Such a fault becomes remarkable at the small split of especially eyes. Thus, both the properties of formation and a loft are antinomy-elements and it is very difficult to reconcile the both simultaneously.

[0004]

[Problem(s) to be Solved by the Invention] In order that this invention person etc. may aim at coexistence of the opening nature of a continuation continuous glass fiber, and a loft in view of this

present condition, Opening nature is good at the time of opening, and research is wholeheartedly repeated about moreover making a loft discover after web formation. Two sorts of continuation continuous glass fibers with which the rates of a thermal contraction differ are opened by the usual method, respectively. The method of making the same loft as a crimp nature continuous glass fiber discovering was proposed by preparing the weld zone which interwove and set the interval after forming a web, heat-treating this, shrinking a continuous glass fiber with the large rate of a thermal contraction, and making a crepe form in a continuous glass fiber with the small rate of a thermal contraction (Japanese Patent Application No. 6-88433).

[0005] According to this method, opening nature is good, and although the nonwoven fabric which was moreover excellent in the loft is obtained, in order to make two sorts of resins with which properties differed, respectively breathe out from the same mouthpiece, the configuration of a mouthpiece becomes complicated and it has the fault that an installation cost increases. Furthermore, since two sorts of continuation continuous glass fibers are made to extend by the same cooling and the hitch, it also has the fault that the configuration of a continuous glass fiber is limited. Moreover, although two kinds of different fiber will exist in one nonwoven cloth layer by interweaving of a continuous glass fiber with the small rate of a thermal contraction, and a continuous glass fiber with the large rate of a thermal contraction, since only the crepe formed with a continuous glass fiber with the small rate of a thermal contraction which exists near the front face of a nonwoven fabric contributes to a loft, from a viewpoint of giving a loft to a nonwoven fabric, it also has the fault that efficiency falls.

[0006] In order that this invention person etc. may cancel these faults and may aim at coexistence of the opening nature of a continuation continuous glass fiber, and a loft, Opening nature tends to be good at the time of opening, and, moreover, you are going to make it discover a loft after web formation. Open two sorts of continuation continuous glass fibers with which the rates of a thermal contraction differ by the respectively well-known method, and the web which consists of a large continuation continuous glass fiber of the rate of a thermal contraction is made into a middle lamella. By carrying out the laminating of the web which becomes both sides of the web from the small continuation continuous glass fiber of the rate of a thermal contraction, and letting this web of three layers that carried out the laminating pass to a heat embossing roll If an interval is prepared and unified and a melting zone is heat-treated further after that, the web which consists of a large continuation continuous glass fiber of the medium-rise rate of a thermal contraction When it perceives contracting more greatly than an outside layer and the web which consists of a small continuation continuous glass fiber of the rate of a thermal contraction of an outside layer forms a crepe between a weld zone and a weld zone, it finds out that a loft is discovered and came to complete this invention. The purpose of this invention is the span bond nonwoven fabric of the three-tiered structure which comes to form a crepe, is excellent in intensity, opening nature, and formation, and aims at offering with bulky the flexible nonwoven fabric which can be especially used suitably as facing of the hygienic goods of a disposable diaper or a sanitary napkin.

[0007]

[Means for Solving the Problem] this invention to both sides of the web which consists of a polyolefine system with the large rate of a thermal contraction, or a polyester system continuation continuous glass fiber A The web which consists of a polyolefine system continuation continuous glass fiber B with the small rate of a thermal contraction After a laminating, The difference of the rate of a thermal contraction of the continuation continuous glass fiber A and the continuation continuous glass fiber B which are the span bond nonwoven fabric which was unified by the weld zone by thermocompression bonding, and which consists of a three-tiered structure, and constitute this web at 10 - 50% And A:B is 35:65-65:35 in an oven-dry-weight ratio, and it is the span bond nonwoven fabric characterized by heat-treating the aforementioned nonwoven fabric and the web which consists of a polyolefine system continuation continuous glass fiber B with the small rate of a thermal contraction forming the crepe.

[0008] The nonwoven fabric concerning this invention carries out the laminating of the web which becomes both sides of the web which consists of a large continuation continuous glass fiber of the rate of a thermal contraction from the small continuation continuous glass fiber of the rate of a thermal contraction, and after forming the web of the three-tiered structure unified by thermocompression

bonding, it is obtained by heat-treating. The well-known method used in manufacture of the nonwoven fabric by the span bond method can apply formation of a web, and the practice of thermocompression bonding as it is. Since the continuation continuous glass fiber used by this invention is non-crimp nature fiber which consists of a single component resin of a polyolefine system or a polyester system, opening nature is good and a web with homogeneous formation is obtained. Moreover, the nonwoven fabric by which thermocompression bonding was carried out as mentioned above has the weld zone which was formed by introducing the layered product of the aforementioned web between the embossing rolls of the heated couple with much heights, therefore set the interval in the nonwoven face side and was established in it while the embossing roll and smooth roll which have much heights, and which were heated.

[0009] Thus, the weld zone prepared on the surface of a nonwoven fabric is combined by heat weld, continuation continuous glass fibers are formed, and the area of a weld zone is 4 - 10% of range of this span bond nonwoven surface-of-cloth product. If the intensity of a nonwoven fabric runs short of the area of a weld zone at less than 4% and it increases exceeding 10%, the nonwoven fabric obtained becomes a thing lacking in a loft and flexibility and is unsuitable. Heat-treatment according [ the nonwoven fabric in which it carried out, and it was unified and the weld zone was established ] to hot blast in the temperature of further 110-140 degrees C and the combination of the time for 1 - 5 minutes is given like the above. As a result of contracting more webs which consist of a large continuation continuous glass fiber of the medium-rise rate of a thermal contraction by this heat-treatment than the web which consists of a small continuation continuous glass fiber of the rate of a thermal contraction of an outside layer, it is connected by the shortest between a weld zone and a weld zone by the web which consists of a continuous glass fiber with the medium-rise large rate of a thermal contraction, and the web which consists of a continuous glass fiber with the small rate of a thermal contraction of an outside layer on the other hand forms a crepe between this weld zone

[0010] The fineness of the continuation continuous glass fiber used in order to give the aforementioned loft by this invention is 1-5 deniers. The flexibility of a nonwoven fabric falls and it is hard coming to use that to which fineness exceeds 5 deniers for uses, such as facing of hygienic goods, and manufacture conditions become severe and a less than 1-denier thing has [ both ] unsuitable fineness. Moreover, although various change of the rate of a thermal contraction of the aforementioned continuation continuous glass fiber is carried out with the kind of resin, polymerization degree, spinning speed (grade of extension), etc. As a resin which forms the polyolefine system continuation continuous glass fiber B with the small rate of a thermal contraction used for this invention The polypropylene and the ethylene propylene random copolymer whose rate of a thermal contraction is 5 - 10%, What made polypropylene the subject and made the rate of a thermal contraction somewhat high like the blend structure of polyethylene and polypropylene etc. can be mentioned. As a resin which, on the other hand, forms a polyolefine system with the large rate of a thermal contraction, or the polyester system continuation continuous glass fiber A For example, the polyethylene whose rate of a thermal contraction is 20 - 40%, the polyethylene terephthalate which is 40 - 60%, The blend structure of polyethylene and polypropylene etc. can be mentioned and 15 - 40% of thing is preferably used for the difference of the rate of a thermal contraction of a continuous glass fiber 10 to 50% in this invention from two sorts of resins which chose suitably and were chosen from these.

[0011] Since formation of the crepe by the web to which the difference of the aforementioned rate of a thermal contraction becomes being less than 10% from a continuous glass fiber with the small rate of a thermal contraction is small, the bulky effect becomes weak. On the other hand, when the difference of the rate of a thermal contraction enlarges exceeding 50% and a feeling of a feel is [ formation of the aforementioned crepe becomes large and ] inferior, since the versatility of the resin used for the combination of such a resin is inferior, it is not suitable. A:B of a polyolefine system with the large rate of a thermal contraction or the oven-dry-weight ratio of the polyester system continuation continuous glass fiber A and the polyolefine system continuation continuous glass fiber B with the small rate of a thermal contraction is 35:65-65:35. Since intensity falls [ this rate ] at less than 35% by the ability not giving a loft to a nonwoven fabric although intensity is excellent when a polyolefine system with the

large rate of a thermal contraction or the polyester system continuous glass fiber A exceeds 65%, it is not suitable. The laminating of the web which consists of a continuation continuous glass fiber B of a polyolefine system with the small rate of a thermal contraction on the other hand is carried out to both sides of the web which consists of the large polyolefine system or the polyester system continuous glass fiber A of the rate of a thermal contraction at about 50:50 rate, respectively. If the ratio of a web which consists of the aforementioned continuation continuous glass fiber B is not equal, since curl will occur in the laminating nonwoven fabric of a three-tiered structure, it is not desirable.

[0012] As explained above, after carrying out the laminating of the web which consists of a small continuation continuous glass fiber of the rate of a thermal contraction, unifying by thermocompression bonding, and the nonwoven fabric concerning this invention establishing a weld zone in both sides of the web which consists of a large continuation continuous glass fiber of the rate of a thermal contraction and forming a nonwoven fabric in them, it is obtained by heat-treating further. Furthermore, since each continuation continuous glass fiber is non-crimp nature fiber which consists of a single component resin of a polyolefine system or a polyester system, opening nature is good and formation is homogeneous. The weld zone which thermocompression bonding is carried out and is formed after web formation of three layers sets an interval, and is arranged. moreover, by subsequent heat-treatment It is connected by the shortest between a weld zone and a weld zone by the web which consists of a large continuation continuous glass fiber of the medium-rise rate of a thermal contraction. The web which consists of a small continuation continuous glass fiber of the rate of a thermal contraction by which the laminating is carried out to both sides of this web on the other hand forms a crepe between this weld zone, and, thereby, a loft is given to a nonwoven fabric. Therefore, the nonwoven fabric by this invention can be especially used for the skin of the body suitably as facing of hygienic goods which contacts directly. \*

[0013]

[Example] Although an example is given to below and this invention is more concretely explained to it, of course, this invention is not limited to these.

[0014] Immediately after heating and fusing the polypropylene resin of example 1 melt flow rate 40 in temperature of 230 degrees C and obtaining the continuation continuous-glass-fiber filament by the well-known melt spinning method, the web which extends this continuous-glass-fiber filament, makes it a continuous glass fiber with a fineness of 2 deniers, is accumulated on a uptake conveyer, and consists of a continuous glass fiber with the small rate of a thermal contraction was obtained. Subsequently, the polyethylene resin of a melt flow rate 20 was used on this web, and the web which accumulates a continuous glass fiber with a fineness of 2 deniers by the same method as the aforementioned web, and consists of a large continuation continuous glass fiber of the rate of a thermal contraction was obtained. Furthermore, the polypropylene resin of a melt flow rate 40 was used on this web, the web which accumulates a continuous glass fiber with a fineness of 2 deniers by the same method as the above, and consists of a continuous glass fiber with the small rate of a thermal contraction was obtained, the laminating of the web of three layers was carried out, and eyes obtained the laminating web of 23 g/m2. The oven-dry-weight ratio of a polypropylene continuous glass fiber and a polyethylene continuous glass fiber was 63:37. The laminating of the polypropylene web was carried out to both sides of a polyethylene web by the oven-dry-weight ratio of 50:50. \*

[0015] This laminating web was introduced between heating embossing rolls and smooth rolls with much punctiform heights, and the nonwoven fabric which prepares the weld zone of the letter of dispersion and consists of an unified three-tiered structure was obtained. Next, this nonwoven fabric was introduced into the hot blast circulation type heat setting machine, and it heat-treated by the relaxed state for hot-blast-temperature 120-degree-C 1 minute. the conditions at the time of manufacturing the aforementioned nonwoven fabric -- the same -- carrying out -- the regurgitation of a mouthpiece -- when it was breathed out from the hole, each continuous glass fiber of the extended same denier was extracted and the rate of a thermal contraction was measured, the polypropylene continuous glass fiber was [ the polyethylene continuous glass fiber of the difference of the rate of a thermal contraction ] 15% 22% 7% The area of a weld zone was 6% to the nonwoven surface-of-cloth product. The density and tensile strength of a nonwoven fabric which were obtained were measured. The test method used in this

invention is as follows.

[0016] A sample with a rate length [ of test-method (1) thermal contraction ] of 50cm is extracted, the sample length L0 when applying a 100mg [ per denier ] load is found, next a load is removed, the sample length L1 when applying a 100mg [ per denier ] load to a sample again, after paying the sample into the boiling water and processing it for 3 minutes is found, and it is a formula about the rate of a thermal contraction (priming contraction) (1). It computed.

Rate (%) of thermal contraction =  $\{(L0-L1)/L0\} \times 100 \dots (1)$

(2) Using the compression tester (form : KES-FB3) by thickness KATO tech incorporated company, the load of 0.5 g/cm<sup>2</sup> was given to 2 2cm of measuring-plane products of a nonwoven fabric, and thickness [ at that time ] D (mm) was measured.

[0017] (3) It asked for the thickness Dmm of the apparent-density-gravity above, and when the eyes of a nonwoven fabric which have this thickness were made into Mg/m<sup>2</sup>, apparent density gravity was computed by the formula (2).

Apparent-density-gravity (g/cm<sup>3</sup>) =  $M/(D \times 1000) \dots (2)$

(4) Using the tensilon [ by tensile strength \*\*\*\* precision industrial incorporated company ] omnipotent tension tester (form-TM-100), the tensile test was performed by 300mm a part for /and 80mm of sample length of speeds of testing, and sample width of face of 100mm, the measured fracture point intensity was doubled three and the tensile strength per 300mm width of face showed it.

[0018] Using the ethylene propylene random copolymer (18% of rates of a thermal contraction) of example 2 melt flow rate 30, and the polyethylene resin (30% of rates of a thermal contraction) of a melt flow rate 20, except having made area of the weld zone of a nonwoven fabric into 8%, the nonwoven fabric which consists of a three-tiered structure of a loft like an example 1 was manufactured, and the density and tensile strength were measured. The difference of the rate of a thermal contraction of two sorts of continuation continuous glass fibers was 12%.

[0019] Except having considered as the polyethylene-terephthalate resin (47% of rates of a thermal contraction) of example 3 intrinsic viscosity  $\eta = 0.65$ , and the polypropylene resin (7% of rates of a thermal contraction) of a melt flow rate 40, the nonwoven fabric which consists of a three-tiered structure of a loft like an example 1 was manufactured, and the density and tensile strength were measured. The difference of the rate of a thermal contraction of two sorts of continuation continuous glass fibers was 40%.

[0020] Except having set the oven-dry-weight ratio of an example 4 polypropylene continuation continuous glass fiber and a polyethylene continuation continuous glass fiber to 40:60, the laminating of the two-layer web which consists of a polypropylene continuation continuous glass fiber like an example 1 was carried out to both sides of the web which consists of a polyethylene continuation continuous glass fiber, the nonwoven fabric which consists of a three-tiered structure of a loft was manufactured, and the density and tensile strength were measured.

[0021] Except having used the ethylene propylene random copolymer (22% of rates of a thermal contraction) of example of comparison 1 melt flow rate 25, and the polyethylene resin (30% of rates of a thermal contraction) of a melt flow rate 18, the laminating of the two-layer web which consists of an ethylene propylene random-copolymer continuation continuous glass fiber like an example 1 was carried out to both sides of the web which consists of a polyethylene continuation continuous glass fiber, the nonwoven fabric which consists of a three-tiered structure of a loft was manufactured, and the density and tensile strength were measured. The difference of the rate of a thermal contraction of two sorts of continuation continuous glass fibers was 8%.

[0022] Except having set the oven-dry-weight ratio of an example of comparison 2 polypropylene continuation continuous glass fiber, and a polyethylene continuation continuous glass fiber to 30:70, the laminating of the two-layer web which consists of a polypropylene continuation continuous glass fiber like an example 1 was carried out to both sides of the web which consists of a polyethylene continuation continuous glass fiber, the nonwoven fabric which consists of a three-tiered structure of a loft was manufactured, and the density and tensile strength were measured.

[0023] Except having set the weight ratio of an example of comparison 3 polypropylene continuation

.continuous glass fiber, and a polyethylene continuation continuous glass fiber to 70:30, the laminating of the two-layer web which consists of a polypropylene continuation continuous glass fiber like an example 1 was carried out to both sides of the web which consists of a polyethylene continuation continuous glass fiber, the nonwoven fabric which consists of a three-tiered structure of a loft was manufactured, and the density and tensile strength were measured.

[0024] The measurement result obtained in the example and the example of comparison was shown in Table 1.

[0025]

[Table 1]

	厚み mm	見掛け 密度、mm	引張強度 kg/30cm
実施例 1	0.45	0.05	26.5
実施例 2	0.43	0.05	24.6
実施例 3	0.47	0.05	31.8
実施例 4	0.39	0.06	26.0
比較例 1	0.29	0.08	24.7
比較例 2	0.25	0.09	30.6
比較例 3	0.61	0.04	18.6

[0026] If the nonwoven fabric which starts this invention a passage clear from Table 1 has strong intensity, and it excels in opening nature since a continuous-glass-fiber filament does not have crimp nature, and formation is good and compares for the same eyes, thickness is very large, apparent density gravity is small, and it excels in the loft (examples 1-4). On the other hand, since formation of a crepe is small at less than 10%, apparent density gravity becomes [ the difference of the rate of a thermal contraction of two sorts of continuation continuous glass fibers ] large, and a loft is inferior (example 1 of comparison). although a loft is excellent when apparent density becomes large, therefore it is inferior in a loft (example 2 of comparison) and the ratio of the continuous glass fiber from a resin with the conversely large rate of a thermal contraction becomes small, although intensity is excellent when the ratio of the continuous glass fiber from a resin with the large rate of a thermal contraction becomes large -- intensity -- being inferior (example 3 of comparison) -- it is not suitable

[0027]

[Effect of the Invention] Since the continuous glass fiber does not have crimp nature, opening nature of this invention is good, it excels in intensity writing as composition called the nonwoven fabric which consists of a three-tiered structure using the nonwoven fabric which was excellent in formation, formation also with the small homogeneous split of eyes is obtained, and it does so the effect of moreover offering a span bond nonwoven fabric suitable as facing of flexible hygienic goods with bulky.

---

[Translation done.]



(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開平8-176947

(43) 公開日 平成8年(1996)7月9日

(51) Int.Cl.<sup>6</sup>

識別記号

庁内整理番号

F 1

技術表示箇所

D 0 4 H 3/16

A 6 1 F 13/54

13/15

A 4 1 B 13/ 02

E

A 6 1 F 13/ 18

3 1 0 Z

審査請求 未請求 請求項の数 1 O L (全 5 頁) 最終頁に続く

(21) 出願番号

特願平6-316944

(22) 出願日

平成6年(1994)12月20日

(71) 出願人 000122298

新王子製紙株式会社

東京都中央区銀座4丁目7番5号

(72) 発明者 丹羽 文雄

東京都江東区東雲1丁目10番6号 新王子  
製紙株式会社東京商品研究所内

(72) 発明者 金 霞

東京都江東区東雲1丁目10番6号 新王子  
製紙株式会社東京商品研究所内

(54) 【発明の名称】 スパンボンド不織布

(57) 【要約】

【目的】 強度、開繊性及び地合に優れ、嵩高で柔軟な衛生材料の表面材に好適な不織布の提供。

【構成】 熱収縮率の大きいポリオレフィン系又はポリエステル系連続長繊維Aからなるウェブの両面に、熱収縮率の小さいポリオレフィン系連続長繊維Bからなるウェブを積層後、熱圧着による融着区域により一体化した、3層構造からなるスパンボンド不織布であって、該ウェブを構成する連続長繊維Aと連続長繊維Bとの熱収縮率の差が10～50%で、且つ絶乾重量比でA:Bが35:65～65:35であり、前記不織布が加熱処理されて、熱収縮率の小さいポリオレフィン系連続長繊維Bからなるウェブがクレープを形成している。

## 【特許請求の範囲】

【請求項1】 熱収縮率の大きいポリオレフィン系又はポリエステル系連続長繊維Aからなるウェブの両面に、熱収縮率の小さいポリオレフィン系連続長繊維Bからなるウェブを積層後、熱圧着による融着区域により一体化した、3層構造からなるスパンボンド不織布であって、該ウェブを構成する連続長繊維Aと連続長繊維Bとの熱収縮率の差が10～50%で、且つ絶乾重量比でA:Bが35:65～65:35であり、前記不織布が加熱処理されて、熱収縮率の小さいポリオレフィン系連続長繊維Bからなるウェブがクレープを形成していることを特徴とするスパンボンド不織布。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】 本発明は、熱収縮率の異なる2種の連続長繊維からなるウェブを、積層一体化し、加熱処理したクレープを有するスパンボンド不織布に関する。更に詳しく述べれば、本発明は、クレープを形成しているスパンボンド不織布であって、強度、開繊性及び地合に優れ、特に使い捨ておむつや生理用ナプキンの衛生材料の表面材として好適に使用しうる嵩高で柔軟な不織布に関するものである。

## 【0002】

【従来の技術】 連続長繊維フィラメントを構成繊維とするスパンボンド不織布は、短繊維を構成繊維とする短繊維不織布に比べて、高強度で比較的安価であるため、種々の用途に使用されている。しかし、一般的に連続長繊維からなるスパンボンド不織布は、捲縮を有する短繊維不織布に比べて、嵩高さや柔軟性が劣っている。このために連続長繊維からなるスパンボンド不織布では、高分子重合体を異形の紡糸孔を持つ紡糸口金から熔融紡糸し、次いで高速気流で延伸固化する際に、この長繊維群の一方の側面のみを冷却することによって、長繊維群に捲縮を発現させた後、この長繊維群を積層、一体化させるというスパンボンド不織布の製造方法が提案されている（特開平1-148862号公報）。

【0003】 この方法で得られるスパンボンド不織布は嵩高で柔軟なものであるが、開繊時に隣接する捲縮性長繊維同士が絡み合い、開繊不良により地合が不均質となるという欠点があり、特に目付の小さい薄物でこの傾向が顕著となる。又、潜在性の捲縮性長繊維でも、ある程度の捲縮が顕在することは避けられないため捲縮性長繊維の有する開繊不良という欠点を有している。この欠点を補うため、並列型、又は偏心芯鞘型に複合され、且つ捲縮を有する複合型長繊維と単成分からなる非複合型長繊維を混織する方法が提案されている（特開平5-195406号公報）。この方法によって、捲縮を有する複合型長繊維の開繊性が良好になり、地合が均質な不織布が得られるのである。しかしながら、この方法においても顕在化した捲縮性長繊維の比率を大きくすれば地合が

悪化し、小さくすれば場合は良好となるが嵩高性において劣るという欠点を有している。このような欠点は、特に目付の小さい薄物で顕著となる。このように、地合と嵩高性の両特性は二律背反的な要素であり、その両方を同時に両立させることは極めて困難である。

## 【0004】

【発明が解決しようとする課題】 本発明者等は、かかる現状に鑑み、連続長繊維の開繊性と嵩高性の両立を図るため、開繊時に開繊性が良く、しかもウェブ形成後に嵩高性を発現させることについて鋭意研究を重ね、熱収縮率の異なる2種の連続長繊維をそれぞれ通常の方法で開繊し、混織してウェブを形成後、間隔をおいた融着区域を設け、これを加熱処理し、熱収縮率の大きい長繊維を収縮させ、熱収縮率の小さい長繊維にクレープを形成させることにより、捲縮性長繊維と同様な嵩高性を発現させる方法を提案した（特願平6-88433）。

【0005】 この方法によれば開繊性が良く、しかも嵩高性に優れた不織布が得られるが、同一の口金から2種のそれぞれ性質の異なった樹脂を吐出させるため、口金の形状が複雑になり、設備費がかさむという欠点を有している。更に、2種の連続長繊維を同一の冷却、牽引装置で延伸させるので、長繊維の形状が限定されるという欠点も有している。又、熱収縮率の小さい長繊維と熱収縮率の大きい長繊維の混織により一つの不織布層内に2種類の異なった繊維が存在することになるが、不織布の表面付近に存在する熱収縮率の小さい長繊維によって形成されるクレープのみが嵩高性に寄与するので、嵩高性を不織布に付与するという観点からは効率が落ちるといふ欠点も有している。

【0006】 本発明者等は、これらの欠点を解消し、連続長繊維の開繊性と嵩高性の両立を図るため、開繊時に開繊性が良く、しかもウェブ形成後に嵩高性を発現させようとして、熱収縮率の異なる2種の連続長繊維をそれぞれ公知の方法で開繊し、熱収縮率の大きい連続長繊維からなるウェブを中層にして、そのウェブの両面に熱収縮率の小さい連続長繊維からなるウェブを積層し、この積層した3層のウェブを熱エンボスロールに通すことによって、溶融区域を間隔を設けて一体化し、その後更に加熱処理すると、中層の熱収縮率の大きい連続長繊維からなるウェブが、外側層より大きく収縮することに着眼し、外側層の熱収縮率の小さい連続長繊維からなるウェブが、融着区域と融着区域の間で、クレープを形成することにより、嵩高性が発現することを見出し、本発明を完成するに至った。本発明の目的は、クレープを形成してなる3層構造のスパンボンド不織布であって、強度、開繊性及び地合に優れ、特に使い捨ておむつや生理用ナプキンの衛生材料の表面材として好適に使用しうる嵩高で柔軟な不織布を提供することを目的とする。

## 【0007】

【課題を解決するための手段】 本発明は、熱収縮率の大

3

きいポリオレフィン系又はポリエステル系連続長繊維Aからなるウェブの両面に、熱収縮率の小さいポリオレフィン系連続長繊維Bからなるウェブを積層後、熱圧着による融着区域により一体化した、3層構造からなるスパンボンド不織布であって、該ウェブを構成する連続長繊維Aと連続長繊維Bとの熱収縮率の差が10～50%で、且つ絶乾重量比でA:Bが35:65～65:35であり、前記不織布が加熱処理されて、熱収縮率の小さいポリオレフィン系連続長繊維Bからなるウェブがクレープを形成していることを特徴とするスパンボンド不織布である。

【0008】本発明に係る不織布は、熱収縮率の大きい連続長繊維からなるウェブの両面に熱収縮率の小さい連続長繊維からなるウェブを積層し、熱圧着により一体化した3層構造のウェブを形成した後、加熱処理することにより得られる。ウェブの形成と熱圧着の実施方法は、スパンボンド法による不織布の製造において用いられている公知の方法がそのまま適用できる。本発明で用いる連続長繊維は、ポリオレフィン系またはポリエステルの単成分樹脂からなる非捲縮性繊維であることから、開繊性は良く、地合は均質なウェブが得られる。又前記のように熱圧着された不織布は、多数の凸部を有する加熱されたエンボスロールと平滑ロールとの間に、或いは多数の凸部をもつ加熱された一対のエンボスロール間に前記ウェブの積層体を導入することで形成され、そのため不織布表面には間隔をおいて設けられた融着区域を有する。

【0009】このようにして不織布の表面に設けられる融着区域は、連続長繊維同士が熱融着によって結合されて形成されたものであり、融着区域の面積は、このスパンボンド不織布面積の4～10%の範囲である。融着区域の面積が4%未満では不織布の強度が不足し、10%を越えて多くなると、得られる不織布が嵩高性と柔軟性を欠くものとなり不適である。前記の如くして一体化され、融着区域が設けられた不織布は、更に110～140℃の温度及び1～5分の時間の組合せで熱風による加熱処理が施される。この加熱処理によって中層の熱収縮率の大きい連続長繊維からなるウェブは、外側層の熱収縮率の小さい連続長繊維からなるウェブより多く収縮する結果、融着区域と融着区域の間は中層の熱収縮率の大きい長繊維からなるウェブにより最短で連結され、一方外側層の熱収縮率の小さい長繊維からなるウェブはこの融着区域間でクレープを形成し、これにより不織布に嵩高性が付与される。

【0010】本発明で前記嵩高性を付与するために用いられる連続長繊維の繊度は、1～5デニールである。繊度が5デニールを超えるものは不織布の柔軟性が低下し、衛生材料の表面材等の用途に使用し難くなり、繊度が1デニール未満のものは製造条件が厳しくなり、ともに不適である。又、前記連続長繊維の熱収縮率は、樹脂

4

の種類、重合度、紡糸速度（延伸の程度）等により様々な変化するが、本発明のために用いられる熱収縮率の小さいポリオレフィン系連続長繊維Bを形成する樹脂としては、熱収縮率が5～10%のポリプロピレン及びエチレン-プロピレンランダム共重合体、ポリエチレンとポリプロピレンのブレンド構造体等の如く、ポリプロピレンを主体にして熱収縮率を少し高くしたものを挙げることができ、一方熱収縮率の大きいポリオレフィン系またはポリエステル系連続長繊維Aを形成する樹脂としては、例えば、熱収縮率が20～40%のポリエチレン、40～60%のポリエチレンテレフタレート、ポリエチレンとポリプロピレンのブレンド構造体等を挙げることができ、本発明ではこれらのなかから適宜選択して選ばれた2種の樹脂から、長繊維の熱収縮率の差が10～50%、好ましくは15～40%のものが使用される。

【0011】前記熱収縮率の差が10%未満であると熱収縮率の小さい長繊維からなるウェブによるクレープの形成が小さいため嵩高効果が弱くなる。これに対して熱収縮率の差が50%を超えて大きくすると前記クレープの形成が大きくなり、手触り感が劣る上、そのような樹脂の組合せに用いる樹脂の汎用性が劣るので適さない。

熱収縮率の大きいポリオレフィン系又はポリエステル系連続長繊維Aと熱収縮率の小さいポリオレフィン系連続長繊維Bとの絶乾重量比は、A:Bが35:65～65:35である。熱収縮率の大きいポリオレフィン系又はポリエステル系長繊維Aが65%を超えると、強度は優れるが、不織布に嵩高性を付与できず、又この割合が35%未満では強度が低下するので適さない。一方、熱収縮率の小さいポリオレフィン系の連続長繊維Bからなるウェブは、ほぼ50:50の割合で熱収縮率の大きいポリオレフィン系又はポリエステル系長繊維Aからなるウェブの両面にそれぞれ積層される。前記連続長繊維Bからなるウェブの比率が均等でないと、3層構造の積層不織布にカールが発生するので好ましくない。

【0012】以上説明したように、本発明に係る不織布は、熱収縮率の大きい連続長繊維からなるウェブの両面に、熱収縮率の小さい連続長繊維からなるウェブを積層し、熱圧着により一体化し、融着区域を設けて不織布を形成した後、更に加熱処理することにより得られる。更に、各連続長繊維はポリオレフィン系又はポリエステルの単成分樹脂からなる非捲縮性繊維であることから、開繊性は良く、地合は均質である。又、3層のウェブ形成後に熱圧着されて形成される融着区域は間隔をおいて配置されていて、その後の加熱処理によって、融着区域と融着区域の間は中層の熱収縮率の大きい連続長繊維からなるウェブにより最短で連結され、一方このウェブの両面に積層されている熱収縮率の小さい連続長繊維からなるウェブはこの融着区域間でクレープを形成し、これにより不織布に嵩高性が付与される。従って、本発明による不織布は、身体の肌に直接接触する衛生材料の表面

材として特に好適に使用しうるものである。

#### 【0013】

【実施例】以下に実施例を挙げて本発明をより具体的に説明するが、本発明は勿論これらに限定されるものではない。

#### 【0014】実施例1

メルトフローレート40のポリプロピレン樹脂を温度230℃に加熱して溶融し、公知の溶融紡糸法で連続長繊維フィラメントを得た後直ちに、この長繊維フィラメントを延伸して、繊維度2デニールの長繊維にし、捕集コンベア上に集積して熱収縮率の小さい長繊維からなるウェブを得た。次いで、このウェブの上にメルトフローレート20のポリエチレン樹脂を用い、前記ウェブと同様の方法で繊維度2デニールの長繊維を集積して熱収縮率の大きい連続長繊維からなるウェブを得た。さらに該ウェブの上にメルトフローレート40のポリプロピレン樹脂を用い、前記と同様の方法で繊維度2デニールの長繊維を集積して熱収縮率の小さい長繊維からなるウェブを得、3層のウェブを積層し、目付が23g/m<sup>2</sup>の積層ウェブを得た。ポリプロピレン長繊維とポリエチレン長繊維の絶乾重量比は63:37であった。ポリプロピレンウェブは、ポリエチレンウェブの両面に50:50の絶乾重\*

$$\text{熱収縮率}(\%) = \{(L_0 - L_1) / L_0\} \times 100 \dots (1)$$

#### (2) 厚み

カトーテック株式会社製圧縮試験機(型式:KES-FB3)を用いて、不織布の測定面積2cm<sup>2</sup>に0.5g/cm<sup>2</sup>の荷重を与え、そのときの厚みD(mm)を測定した。

※

$$\text{見かけ密度}(g/cm^3) = M / (D \times 1000) \dots (2)$$

#### (4) 引張強度

東測精密工業株式会社製テンシロン万能引張試験機(型式:PTM-100)を用いて、引張速度300mm/分、試料長80mm、試料幅100mmで引張り試験を行い、測定された破断点強度を3倍し、300mm幅当たりの引張り強度で示した。

#### 【0018】実施例2

メルトフローレート30のエチレン-プロピレンランダム共重合体(熱収縮率18%)とメルトフローレート20のポリエチレン樹脂(熱収縮率30%)を用い、不織布の融着区域の面積を8%とした以外は実施例1と同様にして嵩高性の3層構造からなる不織布を製造し、その密度と引張強度を測定した。2種の連続長繊維の熱収縮率の差は12%であった。

#### 【0019】実施例3

固有粘度 $\eta = 0.65$ のポリエチレンテレフタレート樹脂(熱収縮率47%)とメルトフローレート40のポリプロピレン樹脂(熱収縮率7%)とした以外は実施例1と同様にして嵩高性の3層構造からなる不織布を製造し、その密度と引張強度を測定した。2種の連続長繊維の熱収縮率の差は40%であった。

\*量比で積層された。

【0015】この積層ウェブを、多数の点状の凸部をもつ加熱エンボスロールと平滑ロールとの間に導入して、散点状の融着区域を設け、一体化した3層構造からなる不織布を得た。次にこの不織布を熱風循環型熱処理機に導入して、熱風温度120℃1分間弛緩状態で加熱処理を行った。前記の不織布を製造する際の条件と同じにして口金の吐出孔から吐出され、延伸された同じデニールのそれぞれの長繊維を採取し、その熱収縮率を測定したところポリプロピレン長繊維が7%、ポリエチレン長繊維が22%、熱収縮率の差は15%であった。融着区域の面積は、不織布面積に対して6%であった。得られた不織布の密度と引張り強度を測定した。本発明中で用いた試験方法は以下の通りである。

#### 【0016】試験方法

##### (1) 熱収縮率

長さ50cmの試料を採取し、1デニール当り100mgの荷重をかけた時の試料長さL<sub>0</sub>を求め、次に荷重を取り除き試料を沸騰水中に入れ、3分間処理した後、再び試料に1デニール当り100mgの荷重をかけた時の試料長さL<sub>1</sub>を求め、熱収縮率(沸水収縮率)を式(1)により算出した。

##### ※【0017】(3) 見かけ密度

前記の厚みDmmを求め、この厚みを有する不織布の目付をMg/m<sup>2</sup>とした時、見かけ密度を式(2)により算出した。

#### 30 【0020】実施例4

ポリプロピレン連続長繊維とポリエチレン連続長繊維の絶乾重量比を40:60とした以外は実施例1と同様にしてポリプロピレン連続長繊維からなる2層のウェブをポリエチレン連続長繊維からなるウェブの両面に積層し、嵩高性の3層構造からなる不織布を製造し、その密度と引張強度を測定した。

##### 【0021】比較例1

メルトフローレート25のエチレン-プロピレンランダム共重合体(熱収縮率22%)とメルトフローレート18のポリエチレン樹脂(熱収縮率30%)を用いた以外は実施例1と同様にしてエチレン-プロピレンランダム共重合体連続長繊維からなる2層のウェブをポリエチレン連続長繊維からなるウェブの両面に積層し、嵩高性の3層構造からなる不織布を製造し、その密度と引張強度を測定した。2種の連続長繊維の熱収縮率の差は8%であった。

##### 【0022】比較例2

ポリプロピレン連続長繊維とポリエチレン連続長繊維の絶乾重量比を30:70とした以外は実施例1と同様にしてポリプロピレン連続長繊維からなる2層のウェブを

ポリエチレン連続長繊維からなるウェブの両面に積層し、嵩高性の3層構造からなる不織布を製造し、その密度と引張強度を測定した。

【0023】比較例3

ポリプロピレン連続長繊維とポリエチレン連続長繊維の重量比を70:30とした以外は実施例1と同様にしてポリプロピレン連続長繊維からなる2層のウェブをポリエチレン連続長繊維からなるウェブの両面に積層し、嵩高性の3層構造からなる不織布を製造し、その密度と引張強度を測定した。

【0024】実施例及び比較例で得られた測定結果を表1に示した。

【0025】

【表1】

	厚み mm	見掛け 密度、mm	引張強度 kg/30cm
実施例1	0.45	0.05	26.5
実施例2	0.43	0.05	24.6
実施例3	0.47	0.05	31.8
実施例4	0.39	0.06	26.0
比較例1	0.29	0.08	24.7
比較例2	0.25	0.09	30.6
比較例3	0.61	0.04	18.6

【0026】表1から明らかなとおり、本発明に係る不織布は、強度が強く、長繊維フィラメントが捲縮性を有しないので開繊性に優れ、地合が良好であり、同一目付で比較すると、厚みが極めて大きく、見かけ密度が小さく、嵩高性に優れている（実施例1～4）。これに対して2種の連続長繊維の熱収縮率の差が10%未満ではクレープの形成が小さいため見かけ密度が大きくなり嵩高性が劣る（比較例1）。熱収縮率の大きい樹脂からの長繊維の比率が大きくなると、強度は優れるが、見掛け密度が大きくなり、従って嵩高性において劣り（比較例2）、逆に熱収縮率の大きい樹脂からの長繊維の比率が小さくなると、嵩高性は優れるが、強度に劣る（比較例3）ので適さない。

【0027】

【発明の効果】本発明は、長繊維が捲縮性を有していないので開繊性が良く、地合の優れた不織布を用いて3層構造からなる不織布という構成としたために、強度に優れ、目付の小さい薄物でも均質な地合が得られ、しかも嵩高で柔軟な衛生材料の表面材として好適なスパンボン

20

30

フロントページの続き

(51) Int. Cl. <sup>6</sup>

D 0 4 H 3/00

識別記号

庁内整理番号

F I

技術表示箇所

D

K